REMARKS

Claims 2, 5, 6, 9,15 and 17 have been amended in response to the objections to these claims. New claims 20-25 include particular limitations that were included in original claims 2, 5, 6, 9 and 15.

The invention, as claimed in independent claim 1, relates to an arrangement including a light-emitting power semiconductor device. The device is disposed on a substrate, and a plastic protective body is formed by injection onto the substrate and shrouds the device substantially form-fittingly on its sides and top, leaving a light exit region exposed for coupling to an optical waveguide. The region between the light-emitting power semiconductor device and the optical waveguide is filled, at least segmentally, with a transparent plastic material.

Independent claim 16 is directed to a method of making an arrangement involving placing a semiconductor device on a substrate, affixing an optical waveguide to the substrate, injection coating the optical waveguide to completely shroud it in plastic forming a protective body, and exposing a light exit surface of the optical waveguide in the outer periphery of the plastic protective body.

Independent claims 1 and 16 stand rejected under 35 USC 103(a) as obvious in view of Broom U.S. Patent No. 5,516,727 and Tanaka U.S. Patent No. 5,218,611.

Broom is cited for disclosure of light emitting device 40 (Fig. 4), substrate 43, plastic protective body 45 (Fig. 4b) and optical waveguide 42. It is admitted that Broom fails to disclose a transparent plastic material in the space between the device and waveguide. It thus is admitted that Broom fails to teach the following limitation of claim 1:

> the region between said light-emitting power semiconductor device (3) and said optical waveguide (8) is filled, at least segmentally, with a transparent plastic material.

While Tanaka '611 is cited for disclosure of transparent filling material, Tanaka '611 does not make up the deficiencies of Broom.

Tanaka '611 does not disclose a space between the solid state waveguide (17) and the semiconductor device. The solid state waveguide here is realized by a solid substance

such as a resin. Tanaka '611 arranges the waveguide **directly** in contact with one light emitting face ("rear cleavage face 4Ab") of the laser diode chip so that the signal between the laser diode chip and the monitor element is not altered by contaminants such as dew or dust (col. 2, lines 8-13). This ensures that the feed-back control achieved by the monitor element is more accurate (col 4, lines 18-23) and as a result, the device is not unnecessarily subject to intense performance due to false feed-back control. Tanaka '611 thus teaches away from the invention of claim 1.

Furthermore, according to Tanaka '611, the other light emitting face of the laser diode chip ("front cleavage face 4Aa") is intended for external light emission . However, since this front cleavage face is not surrounded by a waveguide, the light exiting the device cannot be guided out of the device by the waveguide as required by claim 1. Therefore, the second to last feature of claim 1 is also not disclosed in Tanaka "611.

Broom also teaches away. In contrast to claim 1, Broom teaches that is is <u>un</u>desirable to hermetically seal a laser chip and thereby fill the gap between a waveguide and a semiconductor chip because this can cause accelerated degradation of the mirror facet of the chip and therefore a shortened life expectancy for the device (col. 1, lines 47-67). To counteract these problems, Broom proposed that an "air" gap or a region filled with an inert gas be provided in direct contact with the light emitting facet of the chip region filled with an inert gas be provided in direct contact with the light emitting facet of the chip (col. 2, lines 10-14). This allows the chip to be completely sealed but avoids an contact between the mirror facet of the chip and the encapsulant (col. 3, lines 63-65). If the chip is to be coupled to an "optical output port" (e.g., an optical fiber which can act as a waveguide), then the gap is located between the mirror facet and the optical fiber so that the optical path remains free of encapsulant (col. 4, lines 34-36). The invention accoding to claim 1 does not require that an encapsulant free gap be maintained between the light emitting facet of the chip and the waveguide. On the contrary, according to claim 1 this gap should be filled, at least segmentally, with a transparent plastic material. Therefore, Broom does not suggest the invention according to claim 1.

Even if one of ordinary skill in the art were to attempt to combine the two references Broom and Tanaka '611, he would not achieve the invention according to

claim 1 because, as explained above, Broom advocates the contrary to what is required by the invention and Tanaka '611 does not provide for such a gap at all. Neither Broom nor Tanaka '611 stimulate one of ordinary skill in the art to ensure that a gap between the waveguide and the light emitting surface of the chip exists and to then fill the gap at least segmentally with a transparent plastic material. Therefore, the invention according to claim 1 is nowhere suggested by the references, taken alone or in combination, and claim 1 is allowable under 35 USC 103(a).

With respect to independent method claim 16, it is admitted that Broom does not teach a light exit surface exposed in the region of the outer periphery of the plastic protective body. In the office action it is asserted that it would have been obvious to break of a piece of the hardened plastic body. The cited references, Broom and Tanaka '611, however, nowhere suggest the breaking off a piece of the plastic body, such that prima facie obviousness has not been established.

The remaining claims depend on claims 1 and 16 and are allowable with them and in many cases also provide additional distinguishing features. E.g., claims 2-4 were rejected as unpatentable over Broom in view of Tanaka '611 and US 4,387,385 (hereinafter referred to as "Thillays"), Thillays being said to disclose use of an opaque thermoplastic characterized by filler particles for thermal conductivity. None of the passages in Thillays cited by the Examiner mention the thermal conductivity of the thermoplastic or filler particles. The cited passages at column 2, lines 22-32 and column 4, lines 8-14 merely state that the thermoplastics are made opaque and reflective by the addition of titanuium oxide powder. There is no mention of thermal conductivity. Also, claim 5 was rejected as unpatentable over Broom in view of Tanaka '611 and U.S. 5,307,362 (hereinafter referred to as "Tanaka '362"). Contrary to the Examiner's assertion, the use of a substrate which is a singulated part made from a panel-shaped or stripe shaped metal sheet is not intended to "enhance beam performance". The passage cited by the Examiner (col. 2, lines 13-23) is furthermore irrelevant to claim 5. The use of a substrate structure as described in claim 5 is mainly intended to facilitate the manufacture of such arrangements (see page 17, last paragraph of the translated specification).